

REMARKS

Rejections under 35 USC §103(a)

Claims 1 and 2 were rejected under 35 USC §103(a) as being obvious over Hiraki (U.S. Patent No. 6,337,060) in view of Sundback (U.S. Patent No. 5,047,182) in view of Slutz (EP 0 482 372).

Claim 1 has been amended as follows:

A high-purity high-hardness ultrafine-grain diamond sintered body consisting essentially of ultrafine-grain natural diamond powder having a grain size of 100 nm or less, wherein said diamond sintered body has Vickers hardness of 80GPa or more and is produced by:

subjecting ultrafine-grain natural diamond powder having a grading range of zero to 0.1 μ m to a desilication treatment;

dispersing the desilicated diamond powder in aqueous solution;

freezing the solution thereby obtaining ice dispersed with diamond powder;

subliming the ice thereby obtaining freeze-dried diamond powder; and

sintering the freeze-dried powder without a sintering aid.

The amendment is supported in the original disclosure, for example at page 6, line 22 to page 7, line 10 and page 8, lines 26-30.

The Examiner alleged as follows:

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the diamond particles of Hiraki with the freeze-drying of Sundback and the process of sintering without a sintering aid of Slutz because Sundback teaches that freeze drying can be used with a variety of inorganic powders because freeze drying can overcome thermal drying stresses which would be destructive. Additionally, an ostensible "freeze-drying" process allows for capillary forces between the inorganic particles, thereby pulling them together during drying to yield a denser, smoother surface (col. 3, lines 25-37; col. 3, lines 58-66). Further, Slutz teaches that sintering the polycrystalline CBN/diamond conjoint compacts make the masses fully dense and thermally stable (col. 2, lines 16-22).

(Office Action, page 2-3). As the Examiner admits, Hiraki does not teach freeze-drying or sintering without a sintering aid. Moreover, Hiraki does not teach or suggest sintering of ultrafine-grain natural diamond powder.

As to Sundback, the reference describes at the cited portion as follows:

The present invention pertains to forming complexly shaped articles by **freeze-forming a non-aqueous slurry of inorganic solids**, generally ceramic and/or metallic, by molding the slurry into a desired shape and then drying the frozen shape by non-destructive evaporation/sublimation to provide a green article with adequate green strength. The forming operation can be performed under low pressure and the green article can be conventionally sintered.

(Sundback, column 1, lines 17-24). However, according to Sundback, the inorganic solids are made into non-aqueous slurry. In contrast, the desilicated diamond powder is dispersed in aqueous solution.

As to Slutz, the reference describes at the cited portion as follows:

The manufacture of CBN by an HP/HT process is known in the art and is typified by the process described in U.S. Pat. No. 2,947,617, a basic monocrystalline CBN case. U.S. Pat. No. 4,188,194 describes a process for making sintered polycrystalline CBN compacts which utilizes pyrolytic hexagonal boron nitride (PBN) in the absence of any catalyst/sintering aid material.

(Slutz, column 1, lines 8-15). However, Slutz here discusses CBN or PBN but not diamond.

Slutz discusses diamond for example as follows:

The unsupported, sintered CBN/diamond conjoint compacts disclosed herein can be fabricated by subjecting a mixture of CBN or a CBN-forming material, and diamond particles in the substantial absence of catalyst/sintering aid material to HP/HT conditions for forming an unsupported sintered polycrystalline CBN compact characterized by CBN

intercrystal bonding and containing diamond particles dispersed throughout the conjoint compact. Feed for forming the novel conjoint compacts includes PBN, monocrystalline and polycrystalline CBN, and boron rich polycrystalline CBN.

(Slutz, abstract, 2nd paragraph). Thus, diamond is discussed as a mixture with CBN or a CBN-forming material. Also, nothing in Slutz indicates sintering of ultrafine-grain natural diamond powder having a grain size of 100 nm or less.

It is not clear in the Examiner's allegation how such disclosure is relevant to the present invention. Even if Slutz discloses sintered CBN/diamond conjoint compacts with substantial absence of catalyst/sintering aid material, there is no reason that a person of ordinary skill in the art would combine or modify the teachings of Hiraki and Sundback to make the present invention as recited in claim 1.

As shown above, as to Slutz, the Examiner merely noted that "Slutz teaches that sintering the polycrystalline CBN/diamond conjoint compacts make the masses fully dense and thermally stable." The allegation does not make the reason clear why the claimed invention would have been obvious.

The MPEP 2143 explains that the key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in KSR noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. Thus, the rejection has not established a prima facie case of obviousness.

For at least these reasons, the rejection is improper and should be withdrawn.

Claims 3 and 4 were rejected under 35 USC §103(a) as being obvious over Hiraki (U.S. Patent No. 6,337,060) in view of Sundback (U.S. Patent No. 5,047,182) in view of Slutz (EP 0 482 372) as in claims 1 and 2, further in view of Yazu (US 4,610,699).

Claim 3 has been amended to recite, among other things, “dispersing the desilicated diamond powder in aqueous solution; freezing the solution thereby obtaining ice dispersed with diamond powder; subliming the ice thereby obtaining freeze-dried diamond powder; enclosing the freeze-dried powder consisting essentially of ultrafine-grain natural diamond powder in a Ta or Mo capsule.”

The Examiner alleged as follows:

Slutz teaches a high pressure/high temperature apparatus which sinters at a pressure of 80 Kbars (8 GPa), which is essentially the same as the present claims. Further, Slutz teaches that the temperature should be from about 1500 to 2300 (col. 4, lines 3-10). Hiraki, Sundback, and Slutz do not teach the use of a Ta or Mo capsule. Yazu teaches a reaction vessel (capsule) that is sealed containing the diamond powder for sintering. The vessel can be made of Ta or Mo (Example 1; claim 4). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the capsule of Yazu with the method of producing diamonds in Hiraki, Sundback and Slutz because Yazu teaches that a diamond sintered in this way has superior heat-resistance and abrasion-resistance (abstract).

(Office Action, page 3, item 4).

As discussed above, the rejection does not make the reason clear why it is obvious to combine Hiraki and Sundback with Slutz, which discusses a mixture with CBN or a CBN-forming material but not a sintered body consisting essentially of ultrafine-grain natural diamond powder. Yazu, allegedly disclosing a reaction vessel (capsule) made of Ta or Mo, does not remedy the deficiencies of Hiraki, Sundback, and Slutz.

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Art Unit: 4162

Amendment under 37 C.F.R. §1.111
Attorney Docket No.: 052514

Thus, the rejection has not established a prima facie case of obviousness.

For at least these reasons, the rejection is improper and should be withdrawn.

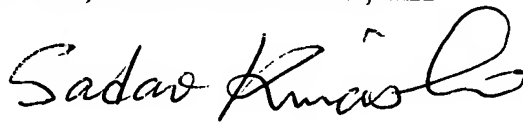
In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP



Sadao Kinashi

Attorney for Applicants
Registration No. 48,075
Telephone: (202) 822-1100
Facsimile: (202) 822-1111

SK/ar